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(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Xiaodong Li

Application No.: 10/583,534   Confirmation No.: 4954

Filed: June 5, 2007   Art Unit: 2461

For: **METHODS AND APPARATUS FOR MULTI-**   Examiner: M. L. Sekul
CARRIER COMMUNICATIONS WITH
VARIABLE CHANNEL BANDWIDTH

Amendment Under 37 C.F.R. § 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

    The present communication responds to the Office Action dated January 7, 2010 in the above-identified application. Please amend the application as follows:

    Amendments to the Claims are reflected in the listing of claims beginning on page 2.

Amendments to the Claims:

1.   (Currently Amended) In a variable bandwidth wireless communication system communicating under multiple different communication schemes that each have a different bandwidth, a process performed by a base station of generating an information bearing signal for wireless transmission, the process comprising:

utilizing by the base station a number of subcarriers to construct a variable bandwidth wireless channel;

utilizing by the base station groups of subcarriers, wherein each group includes a plurality of subcarriers;

maintaining a fixed spacing between adjacent subcarriers;

adding or subtracting, by the base station, groups of subcarriers to scale the variable bandwidth wireless channel and achieve an operating channel bandwidth; and

wherein a core-band, including a plurality of subcarrier groups, substantially centered at an operating center frequency of the different communication schemes, is utilized by the base station as a broadcast channel carrying radio control and operation ~~signaling~~signalling, where the core-band is substantially not wider than a smallest possible operating channel bandwidth of the system; and

wherein the information bearing signal has a primary preamble sufficient for basic radio operation, and wherein:

the primary preamble is a direct sequence in the time domain with a frequency content confined within the core-band, or is an orthogonal frequency-divisional multiplexing (OFDM) symbol corresponding to a particular frequency pattern within the core-band; and

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to

sidelobes;

a cross-correlation with other primary preambles having a small

cross-correlation coefficient with respect to power of other

primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the

properties.

2.   (Previously Presented) The process of claim 1, wherein the information bearing signal is:

an orthogonal frequency division multiple access (OFDMA) signal; and is

utilized in a downlink with a duplexing technique that is either Time Division

Duplexing (TDD) or Frequency Division Duplexing (FDD).

3-5.   (Canceled)

6.   (Currently Amended) In a variable bandwidth communication network of base stations and mobile stations, wherein a signal comprises groups of subcarriers and each group includes a plurality of subcarriers, a method performed by a mobile station comprising:

maintaining a fixed spacing between adjacent subcarriers;

adjusting a number of groups of subcarriers to scale a channel and attain an

operational bandwidth;

utilizing a core-band, substantially centered at an operating center frequency to

carry synchronization information, wherein the core-band is narrower than

or equal to a smallest possible operating channel bandwidth of the

network and the signal includes a primary preamble sufficient to enable

radio operations, the primary preamble including a direct sequence in the

time domain with a frequency content confined within the core-band or including an OFDM symbol corresponding to a particular frequency pattern within the core-band;

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to sidelobes;

a cross-correlation with other primary preambles having a small cross-correlation coefficient with respect to power of other primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the properties; and

scanning spectral bands of different center frequencies and detecting the synchronization information in the core-band of the operating center frequency and decoding a broadcast channel carrying radio control and operation signalling provided by a base station to the mobile station via the core-band.

7.   (Canceled)

8.   (Previously Presented) The method of claim 6, wherein the signal is an orthogonal frequency division multiple access (OFDMA) signal, and the signal is utilized in a downlink with a duplexing technique that is either Time Division Duplexing (TDD) or Frequency Division Duplexing (FDD).

9.   (Canceled)

10.   (Canceled)

11.   (Currently Amended)   In a variable bandwidth communication network wherein a communication signal utilizes groups of subcarriers, wherein each group comprises a plurality of subcarriers, and a mobile station has an adaptable bandwidth, the mobile station comprising:

an analog-to-digital converter for signal sampling;

a Fast Fourier Transform and Inverse Fast Fourier Transform processor (FFT/IFFT), wherein a fixed spacing between adjacent subcarriers is maintained;

a scanner for scanning spectral bands of specified center frequencies;

a facility for decoding a broadcast channel including radio control and operation signalling associated with ~~the area in~~ a core-band including a plurality of groups, wherein the core-band is not wider than a smallest possible operating channel bandwidth of the network; and

a facility for adding groups to widen the channel bandwidth for remainder of the communication, wherein the communication signal further utilizes the core-band for communicating a primary preamble sufficient to enable radio operations, the primary preamble being a direct sequence in the time domain with a frequency content confined within the core-band or being an OFDM symbol corresponding to a particular frequency pattern within the core-band,

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to sidelobes;

a cross-correlation with other primary preambles having a small
cross-correlation coefficient with respect to power of other
primary preambles; and
a small peak-to-average ratio; and
wherein a large number of primary preamble sequences exhibit the
properties.

12.   (Canceled)

13.   (Previously Presented)   The mobile station of claim 11, wherein the communication signal is an orthogonal frequency division multiple access (OFDMA) signal, and the communication signal is utilized in a downlink with a duplexing technique that is either Time Division Duplexing (TDD) or Frequency Division Duplexing (FDD).

14-21. (Canceled)

22.   (Currently Amended) A cellular base station comprising:
circuitry configured to transmit a broadcast channel in an orthogonal frequency
division multiple access (OFDMA) core-band, wherein the core-band is
substantially centered at an operating center frequency and the core-band
includes a first plurality of subcarrier groups, wherein each subcarrier
group includes a plurality of subcarriers, wherein the core-band is utilized
to communicate a primary preamble sufficient to enable radio operations,
the primary preamble being a direct sequence in the time domain with a
frequency content confined within the core-band or being an OFDM
symbol corresponding to a particular frequency pattern within the core-
band,
wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to
sidelobes;

a cross-correlation with other primary preambles having a small
cross-correlation coefficient with respect to power of other
primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the
properties; and

circuitry configured to transmit control and data channels using a variable band
including a second plurality of subcarrier groups, wherein the variable
band includes at least the core-band.

23.   (Previously Presented) The cellular base station of claim 22 wherein the
circuitry configured to transmit the broadcast channel is further configured to transmit
radio network information in the broadcast channel.

24.   (Previously Presented) The cellular base station of claim 22 further
comprising circuitry configured to transmit synchronization information in the core-band.

25.   (Previously Presented) The cellular base station of claim 22 wherein the
circuitry configured to transmit the broadcast channel is further configured to transmit in
a time slot format.

26.   (Previously Presented) The cellular base station of claim 22 wherein the
base station operates in an OFDMA frequency division duplex (FDD) or time division
duplex (TDD) mode.

27.   (Currently Amended) A cellular mobile station comprising:

circuitry configured to receive synchronization information from a base station in

an orthogonal frequency division multiple access (OFDMA) core-band,

wherein the core-band is substantially centered at an operating center

frequency and the core-band includes a first plurality of subcarrier groups

where each subcarrier group includes a plurality of subcarriers, wherein

the core-band is utilized to communicate a primary preamble sufficient to

enable radio operations, the primary preamble being a direct sequence in

the time domain with a frequency content confined within the core-band or

being an OFDM symbol corresponding to a particular frequency pattern

within the core-band,

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to

sidelobes;

a cross-correlation with other primary preambles having a small

cross-correlation coefficient with respect to power of other

primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the

properties;

circuitry configured to synchronize with the base station using the received

synchronization information; and

circuitry configured to receive control and data channels using a variable band

including a second plurality of subcarrier groups, wherein the variable

band includes at least the core-band.

28.   (Currently Amended) The cellular mobile station of claim 27 wherein the

circuitry configured to receive the synchronization information from the base station in

the core-band is further configured to receive ~~the~~ cell identification information from the base station in the core-band.

29.   (Previously Presented)   The cellular mobile station of claim 27 further comprising circuitry configured to receive a broadcast channel in the core-band.

30.   (Previously Presented) The cellular mobile station of claim 29 wherein the broadcast channel carries radio network information.

31.   (Previously Presented)   The cellular mobile station of claim 27 further comprising circuitry configured to transmit a preamble after synchronizing with the base station.

32.   (Currently Amended)   A variable bandwidth communication method comprising:

transmitting a broadcast channel by a cellular base station in an orthogonal frequency division multiple access (OFDMA) core-band, wherein the core-band is substantially centered at an operating center frequency and the core-band includes a first plurality of subcarrier groups, wherein each subcarrier group includes a plurality of subcarriers, wherein the core-band is utilized to communicate a primary preamble sufficient to enable radio operations, the primary preamble being a direct sequence in the time domain with a frequency content confined within the core-band or being an OFDM symbol corresponding to a particular frequency pattern within the core-band

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to sidelobes:

a cross-correlation with other primary preambles having a small
cross-correlation coefficient with respect to power of other
primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the
properties; and

transmitting control and data channels by the cellular base station using a
variable band including a second plurality of subcarrier groups, wherein
the variable band includes at least the core-band.

33.   (Previously Presented)   The method of claim 32 wherein the broadcast
channel carries radio network information.

34.   (Previously Presented)   The method of claim 32 further comprising
transmitting by the base station synchronization information in the core-band.

35.   (Previously Presented)   The method of claim 32 wherein the transmissions
are in a time slot format.

36.   (Previously Presented)   The method of claim 32 wherein the cellular base
station operates in an OFDMA frequency division duplex (FDD) or time division duplex
(TDD) mode.

37.   (Currently Amended)   A variable bandwidth communication method
comprising:

receiving synchronization information by a cellular mobile station from a base
station in an orthogonal frequency division multiple access (OFDMA) core-
band, wherein the core-band is substantially centered at an operating
center frequency and the core-band includes a first plurality of subcarrier

groups where each subcarrier group includes a plurality of subcarriers, wherein the core-band is utilized to communicate a primary preamble sufficient to enable radio operations, the primary preamble being a direct sequence in the time domain with a frequency content confined within the core-band or being an OFDM symbol corresponding to a particular frequency pattern within the core-band

wherein properties of the primary preamble comprise:

an autocorrelation having a large correlation peak with respect to sidelobes;

a cross-correlation with other primary preambles having a small cross-correlation coefficient with respect to power of other primary preambles; and

a small peak-to-average ratio; and

wherein a large number of primary preamble sequences exhibit the properties;

synchronizing the cellular mobile station with the base station using the received synchronization information; and

receiving control and data channels by the cellular mobile station using a variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band.

38.   (Previously Presented) The method of claim 37 wherein the receiving of the synchronization information by the cellular mobile station from the base station in the core-band includes receiving cell identification information from the base station in the core-band.

39.   (Previously Presented) The method of claim 37 further comprising receiving by the cellular mobile station a broadcast channel in the core-band.

40.   (Previously Presented)   The method of claim 39 wherein the broadcast channel carries radio network information.

41.   (Previously Presented)   The method of claim 37 further comprising transmitting by the cellular mobile station a preamble after synchronizing with the base station.

42.   (New)   The process of claim 1, wherein an auxiliary preamble, occupying the side-band, is combined with the primary preamble to form a full-bandwidth preamble in either the time domain or the frequency domain, wherein the side-band is the difference between the core-band and an operating bandwidth, and wherein:

the auxiliary preamble is either a direct sequence in the time domain with a frequency response confined within the side-band, or is an OFDM symbol corresponding to a particular frequency pattern within the side-band;

the full-bandwidth preamble allows a base station to broadcast the full-bandwidth preamble and a mobile station to use the primary preamble of the full-bandwidth preamble to access the base station; and

properties of the full-bandwidth preamble sequence comprise:

a large correlation peak with respect to sidelobes, in case of an autocorrelation;

a large ratio between the correlation peak and sidelobes, in case of a correlation with the primary preamble of the full-bandwidth preamble.

a small cross-correlation coefficient with respect to power of other full-bandwidth preamble sequences, in case of cross-correlation with other full-bandwidth preambles

a small cross-correlation coefficient with respect to the power of the full-bandwidth preamble, in case of cross-correlation with a primary

preamble different from the primary preamble of the full-bandwidth

preamble;

a small peak-to-average ratio; and

wherein a large number of full-bandwidth preamble sequences exhibit

such properties.